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May 26, 2015

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In a paper recently published* on some changes in form of the prostate and floor of the bladder, I have shewn that the inter-ureteral bar of muscular fibres, so frequently met with in cases of enlarged prostate, is to be regarded as the outcome of efforts, by the development of extra-ordinary agents of micturition, to expel urine from a part where it is apt to lodge and cause inconvenience. In connection with these investigations, I have met with instances where an unusually depressed state of the floor of the bladder, or trigone, appeared to me to have existed previously to an enlarged prostate; in fact, that a condition of residual urine preceded, and was not the sequence of, enlargement of the gland. The trigone; or floor of the bladder, in addition to being a highly sensitive part, is peculiar in that it contains but few muscular fibres in its composition; muscle in abundance may be found as low as a line corresponding with the openings of the ureters, and marking the superior boundary of the trigone, and below in the prostate; between these two points, the power of muscular contraction can hardly be said to exist. Assuming that, from any cause, such as long retention of urine, habit, position of the body, or the weakness connected with advancing years, the trigone, or non-contractile part of the bladder, becomes permanently depressed or altered in form, so that the person finds himself unable to get rid of the last half-ounce or so of urine, the effect will be frequently repeated expulsive efforts

* *Liverpool Med. Chir. Journal*, July, 1885.

in all the muscles immediately adjacent to a part which, by reason of its connections and structure, has no power of exercising contractility. This will eventually lead, as I have shewn, to the hypertrophy of the muscular fibres between the orifices of the ureters—the inter-ureteral bar—as well as, I believe, to that of the muscular fibres so largely entering into the composition of the prostate. In this, I submit, will be found the immediate cause of prostatic hypertrophy. The change being an example of an hypertrophy, its production by conditions favouring the formation of other over-growths observed in the body seems to be reasonable. Such a view, as applied to the large prostate, is strengthened by certain clinical observations. A frequent desire to empty the bladder is constantly met with in what is regarded as the earliest stage of prostatic hypertrophy, and long before the gland has assumed any considerable size; the more frequent are the calls to urinate, the more rapidly does the prostate grow, and all circumstances which tend to increase irritability of the bladder may be said to favour the development of this condition. Lastly, the only means which are known to have caused the opposite state, namely that of atrophy, to be engrafted on the hypertrophied gland, are those which for a considerable time converted a muscular and physiological act into a purely mechanical one, for instance, the case I published* some years ago (since repeated with equally satisfactory results), where by the wearing of a cannula inserted through the perineum the process of micturition was reduced to the mechanical act of turning a tap on the part of the patient. Though regarding senile enlargement of the prostate as an hypertrophic change, I was at a loss to explain how it was induced until I met with instances where, from the conformation of the bladder, an irritating condition

* *British Medical Journal*, December 24, 1881, and April 8, 1882.

of residual urine seems to have preceded, and not to have been the consequence of, an enlarged prostate. Instances in practice are not uncommon in elderly males where all the symptoms usually assigned to prostatic enlargement are present, without there being evidence, beyond the presence of some residual urine, that any physical change in the gland has taken place.

I have frequently noticed that condition of unnatural contractility about the muscles connected with micturition, to which Sir James Paget's expression of "stammering with the urinary organs" may be applied, precede prostatic hypertrophy. I have a case under observation, where a locomotive engine-driver, aged 53, has, owing it is believed to the constant concussion connected with his occupation, been a stammerer of this kind. Rectal examination now shews that his prostate is commencing to enlarge, as not only is it breadthening, but a distinct band of what I take to be muscular tissue is to be felt stretching across and filling it up. I was able to demonstrate this to my House Surgeon, Dr. Collins, and my clinical class, who had no doubt about the facts, whatever the construction placed on them might be. The sequence of events in this case appears to have been enforced retention by reason of the man's employment, incomplete emptying of the bladder, irregular and spasmodic efforts to expel residual urine, terminating in commencing hypertrophy of the muscles principally involved, namely, those associated with the expulsive action of the bladder. The frequency with which the floor of the gland is the first to shew the hypertrophic change, seems to strengthen the inference I have drawn from the development of the inter-ureteral bar, and to indicate that both conditions are the direct result of straining and an excess in the expulsive action of the bladder and associated parts. Structurally, the inter-ureteral bar and the hyper-

trophied prostate are identical, with the exception that in the latter will be found the follicles which have led to it being regarded as a glandular body. It is impossible to examine some of the commoner forms of advanced prostatic hypertrophy without being struck with their resemblance to what I would describe as growing casts of the interior of a frequently contracting bladder.

But it may be urged that if repeated expulsive action on the part of the bladder causes enlargement of the prostate to follow, how is it that stone and urethral stricture do not in like manner occasion it as a uniform consequence. To this I would reply that stone and stricture as excitants of expulsion are general or varying in their operations, and do not, as a rule, merely involve a limited area of the bladder wall, consequently the hypertrophy following stricture is universal so far as the viscus is concerned. In the same way, the whole bladder is implicated when a growing prostate becomes in addition an obstacle to micturition. When a stone is *fixed* to the bladder, it is, I believe, subjected to precisely similar influences on the part of the bladder wall immediately adjacent to it as those described in connection with the trigone, and may result, as I have seen, in a circumferential development of muscular tissue sufficient in some instances to produce sacculation. This is not an uncommon process, and may be studied with advantage in those cases where secondary calculi are developed as a consequence of surface irregularities produced by a large prostate, and which I have referred to elsewhere as fixed or stationary stones.* Further, it may be urged that such an explanation cannot be held to cover those instances where persons with more or less enlarged prostates do not suffer from them. I have investigated cases of this kind generally with the result of finding out that, at some period in their history, considerable

* *Annals of Surgery*, June, 1885.

urinary irritation was present and persistent. That an hypertrophy may prove to be *à precise compensation*, without, on the one hand, falling short, or, on the other, overlapping, I think we have evidence of here as in other parts of the body.

It has been objected that enlargement of the prostate cannot be regarded as a mere muscular hypertrophy, as it does not occur during those periods of life which are most remarkable for muscular activity and development. On the other hand, it is hardly necessary to remark that, though an hypertrophic act, in which muscular tissue is principally involved, it is really prompted by alterations in the form or function of a contiguous part which are the products of advancing years.

It may not be out of place to observe in connection with analogous processes of hypertrophy, which in general terms have been referred to, that the best marked are those where structural defects are remedied, not in the part itself at fault, but in that which is adjacent. In the heart it is not the valve that is reproduced, but the ventricle or auricle which is augmented. Nor does the analogy cease here, for as the hypertrophied heart in turn occasions symptoms peculiar to itself, in like manner does the large prostate produce its own derangements.

In conclusion, it should be remembered that the changes and diseases to which the hypertrophied gland is liable, and about which there is much to be said of great practical value, must not be confounded with the primary lesion it is desired here to refer to.

In addition to the valuable paper and plates by Sir Charles Bell, on the muscles of the ureters,* mention must be made of Mr. Viner Ellis' communication on the muscular arrangements of the genito-urinary apparatus.† In reference

* *Med. Chir. Trans.*, London, vol. iii. † *Ibid.*, vol. xxi.

to the impossibility of dissociating the functions of the bladder and prostate, the latter author remarks: "I would propose the name *Orbicularis vel Sphincter urethræ* for both the prostate and the prolongation around the membranous urethra; whilst I would confine the old term, "prostate" (without the word "gland") to the thickened and more powerful part near the neck of the bladder. This orbicularis may be considered as only an advanced portion of the circular layer of the bladder, though it must have the power of acting independently of the vesical fibres." The truth of this I never fully realised until I had practised, and watched the result of, a considerable number of operations, undertaken with the view of permanently relieving urgent symptoms attendant upon the large prostate.

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